

Biomolecules and nanoparticles: friends or enemies?

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Abstract. The structural aspects of the interaction of nanoparticles with biological macromolecules of various types in liquid suspensions are presented. The general questions concerning the development of nanoparticles for biomedical applications, the behavior of nanoparticles in biological media and their biocompatibility are considered. Particular attention is paid to the structural characterization of biological solutions with nanoparticles and their clusters, with a special accent to applications of X-ray and neutron scattering methods, in the framework of complex studies combining different approaches. Experimental examples are given of studying the structural effects of nanoparticles in biological solutions, including carbon nanoclusters (fullerenes, nanodiamonds) and magnetic structures (nanocrystals and their associations with protein molecules).



Mikhail V. Avdeev, Ph.D., Sc.D. received his diploma of engineering physicist (specialization in solid-state physics) from Moscow Engineering Physics Institute in 1995. He entered the Frank Laboratory of Neutron Physics, Joint Institute for Nuclear Research, (FLNP JINR), Dubna, Moscow Region, Russia, in 1993 and was awarded in 2002 the Ph.D. degree for studies of fractal properties of protein surfaces; in 2012 the Sc.D. degree for research in small-angle neutron scattering from highly dispersed nanosystems. Research interests cover various areas of structural investigations using neutron and X-ray scattering methods, including small-angle scattering on complex multicomponent systems (magnetic fluids, nanocarbon materials, biological solutions), reflectometry at interfaces with liquid phases (adsorption of nanoparticles from colloidal solutions, electrochemical interfaces) and the development of experimental facilities for neutron scattering (neutron reflectometry and small-angle scattering at the IBR-2 pulsed reactor, JINR, Dubna). He is currently the head of the Neutron optics sector of the Department of neutron investigations of condensed matter at FLNP, JINR. The author of more than 180 publications and several lecture courses at Moscow State University, St. Petersburg State University and Dubna State University.